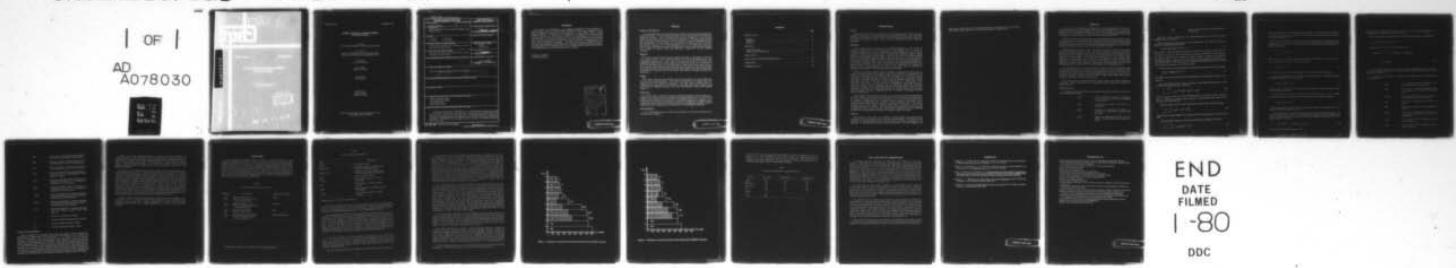


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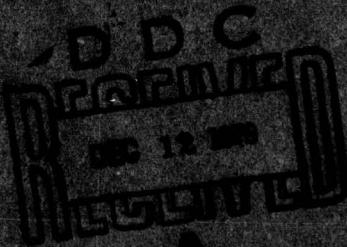
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DEFINITION OF COMBINED OPERATIONS PLANNING
IN THE U.S. NAVY

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**OPTIMAL OFFICER ACCESSION PLANNING
FOR THE U.S. NAVY**

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes the development of a multiperiod goal programming model for deciding how many officers the Navy should commission from several commissioning sources for several career specialty areas. The model, called the Accession Into Designators (AJDS) model, has been adopted by OP-130, Officer Program Implementation Branch DCNO(MP&T) for planning and policy analysis. An example illustrates uses of the model.		

FOREWORD

This research and development was conducted in response to Navy Decision Coordinating Paper, Personnel Supply Systems (NDCP-Z0107-PN) under subproject PN.12, Officer Management Systems, and the sponsorship of the Deputy Chief of Naval Operations (OP-01). The objective of the subproject is to develop a set of user-oriented, computer-based models and techniques to assist in the development of a Navy officer force that meets its manpower requirements. The work described here was also partially funded under ZF55-521-001-010, Manpower Management Decision Technology, Work Unit 03.01, Personnel Modeling Techniques. This report describes the development of the Accession Into Designators (AIDS) Model, a new technique for planning officer accessions. The AIDS model has been adopted by OP-130, the Officer Program Implementation Branch of DCNO(MP&T), for accession planning and policy analysis.

DONALD F. PARKER
Commanding Officer

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SUMMARY

Problem and Background

New planning techniques are needed for determining the number of officers the Navy should commission in its occupational specialty areas to meet subsequent demands for experienced officers. These techniques should consider capabilities of commissioning sources and the characteristics of the officers they produce. Existing planning methods have not prevented the development of "choke points" in several occupational specialty area career paths. At those choke points, the demand for experienced officers exceeds the available inventory for critical assignments such as the department head tour. Concern over choke points and a need to integrate and extend currently separate planning for a number of specialty areas have identified a requirement for new planning techniques.

Approach

→ A computer-based multiperiod goal programming model was developed to determine the number of officers that should be produced from each commissioning for each occupational specialty area. This model, which has been named the "Accession Into Designators" (AIDS) model, considers practical and policy constraints on the operation of each commissioning source and the distribution of officers from each source to each specialty area. It uses observed continuation behavior that differs by source and specialty area in determining an accession plan that meets requirements in each specialty as closely as possible for the early portion of the typical career path, up through the department head level.

Results

→ The AIDS model has been evaluated with several versions of an Unrestricted Line (URL) accession planning problem. This problem concentrated on meeting choke point requirements for the submarine community. The AIDS model identified effects of tradeoffs among requirements at different points along the career path, tradeoffs among requirements in different specialty areas, and the differences among commissioning sources.

Conclusions

→ The AIDS model is effective for accession planning and policy analysis purposes as a supplement to current planning procedures, and has been adopted for use by the Officer Program Implementation Branch (OP-130) of DCNO(MP&T). Further extensions of the model and its uses should be investigated, including the incorporation of 1000/1050 billet requirements into the AIDS model. If the model is to be significantly expanded, nonlinear network and other computational formulations of the model should be considered.

Recommendation

It is recommended that the model be used annually for accession planning and as needed for policy analysis.

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INTRODUCTION

Problem

The Navy lacks effective techniques for determining overall officer accession requirements based upon occupational specialty area and all-Navy needs. Such techniques should specify the number of officers that each commissioning source should produce and how officers produced by these sources should be distributed among occupational specialties.

Background

The U.S. Navy operates a number of commissioning programs to meet its officer manpower requirements. Officers produced by these programs enter a variety of occupational specialty areas, which are identified by numeric designators. The U.S. Naval Academy (USNA) and the Naval Reserve Training Corps (NROTC) programs supply officers for a wide range of specialty areas, while other sources, such as the Naval Flight Officer Candidate (NFOC) program, supply a single specialty area. It has been observed that career continuation behavior differs according to an officer's commissioning source and specialty (Goudreau, 1977). Thus, the choices of which commissioning programs to use and how to distribute officers from these programs to occupational specialties have a major influence on the Navy's ability to meet future requirements for experienced officers. Commissioning programs also differ in other ways that are important for planning purposes, such as cost, capacity, and length of training.

Related occupational specialty areas are grouped into planning communities, such as surface warfare, aviation, and the supply corps. Each community is represented by a community career planner whose duties include developing an accession plan for the community. Such plans indicate the number of new officers (i.e., accessions) required each year to meet the community's current and future manpower requirements. Often these plans are based on the need to meet requirements at a "choke point" in the community career path. At these choke points, requirements exceed projected inventories for a critical type of assignment (e.g., the department head tour). Individual community accession plans are developed separately, without explicit consideration of total Navy constraints. The individual plans are then brought together by an overall accession planner, through a negotiation process, to produce an acceptable all-Navy officer accession plan.

Navy planners have identified a need for new officer accession planning capabilities that will combine a more detailed consideration of community manpower requirements with explicit consideration of all-Navy constraints, over a multiyear planning horizon. The inclusion of requirements at a number of points along the career path in each community, up through traditional choke points, along with identification of the commissioning sources of the officers accessed, would allow communities to meet their manpower needs more accurately. The combination of community and all-Navy planning considerations within a single technique would assist the negotiation process by allowing identification of feasible plans and analysis of tradeoffs between such plans.

Objective

The purpose of this report is to describe a computer-based, mathematical model developed to meet the Navy's officer accession planning needs. The model will not eliminate the existing planning process, but will allow a quantitative assessment of the allocation of commissioning resources among communities. This new capability will

substantially improve the overall timing and quality of the Navy's officer accession plan. The model has been labelled the "Accession Into Designators" (AIDS) model.

APPROACH

The Accessions Into Designators (AIDS) model has been developed to provide the Officer Program Implementation Branch (OP-130) of the DDCO(MPT) with a comprehensive officer accession planning technique. The AIDS model describes an officer by three attributes: (1) community, (2) commissioning source, and (3) relative experience described by the year of commissioned officer service currently being served (YCS).

Officers on board at the beginning of the planning period and those brought on board as accessions in the current or later time periods are projected forward using estimated continuation rates. Lateral flows among communities, such as those between the aviation and the surface communities, are not explicitly included, but are implicitly represented by allowing continuation rates to exceed 1.0 in the "gaining" community.

Requirements for officers in each community are stated in terms of the number needed at different experience levels. The AIDS model uses experience level (EXP) categories defined by groupings of YCS cells to quantify experience. Requirements are determined by the number of authorized positions (bils) and the experience level necessary for these bils. The timing and length of duty tours in these bils determines a career pattern in each community. The AIDS user can define different EXP categories to accommodate different career patterns within the same community and between communities. Where experience requirements can be specified at the YCS level, EXP categories may coincide with YCS but this situation will not generally occur.

The AIDS model does not consider an officer's grade. The choke point problems that motivated development of this model are better described in terms of experience level than grade, as an officer will remain in the same grade for several tours. Since most URL officers follow a common promotion path through their early career, we may use YCS as a surrogate for grade. A grade distinction could be added to the AIDS model later to account for officers not promoted in due course.

This model does not distinguish between regular officers and reserve officers on active duty. Separate regular and reserve categories could be added later if required for planning purposes.

Model Formulation

The AIDS model is a multiperiod goal programming model (Charnes & Cooper, 1977) with the following variables:

$y_{ijk}(t)$	\equiv	Onboard inventory of officers in community i, from source j, with YCS k, at the beginning of time period t.
$x_{ij}(t)$	\equiv	Accessions to community i from source j in time period t.
$\bar{g}_{im}(t)$	\equiv	Shortfall from requirement for EXP m in community i in time period t (negative goal deviation).
$g_{im}^+(t)$	\equiv	Surplus over requirement for EXP m in community i in time period t (positive goal deviation).

$$g^-(t) \equiv \text{Shortfall from total officer inventory limit in time period } t.$$

Note that i refers to community; j , to commissioning source; k , to YCS; m , to EXP category; and t , to time period.

These variables are constrained in the following ways. Some officer inventories depend only upon beginning inventories:

$$y_{ijk}(t) = S_{ij}^t(k-t)I_{ij}(k-t) \text{ for } 2 \leq t \leq k. \quad (1)$$

Here $I_{ij}(k-t)$ is the initial onboard inventory of officers in community i , from source j , with $(k-t)$ YCS. $S_{ij}^t(k-t)$ is the "survival rate" for officers in community i , from source j , who begin with $(k-t)$ YCS, for t time periods. $S_{ij}^t(k-t)$ could be calculated, for example, by dividing the number of officers with k YCS by the number of officers with $(k-t)$ YCS, t time periods before. Note that $y_{ijk}(t)$ is completely determined within the model by initial data and coefficients, for t between 2 and k .

All other officer inventories depend upon subsequent accessions chosen by the model:

$$y_{ijk}(t) = S_{ij}^k(0)x_{ij}(t-k) \text{ for } t > k. \quad (2)$$

Here $S_{ij}^k(0)$ is the continuation rate for officers brought in at the entry level, for k time periods.

The relationship between officer inventories and requirements (goals) for each community and experience level is given by:

$$\sum_{j=1}^J \sum_{k=2}^{u_i(m)} y_{ijk}(t) + g_{im}^-(t) - g_{im}^+(t) = G_{im}(t). \quad (3)$$

Here the $G_{im}(t)$ are inventory or desired onboard goals for community i , EXP m , and time period t . These are our principal goal constraints. The summation index limits J , $u_i(m)$ and $u_i(m)$ will be defined later.

There may also be a limit on the total officer inventory, $E(t)$ in each time period:

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^K y_{ijk}(t) + g^-(t) = E(t). \quad (4)$$

Here $g^-(t)$ may also be thought of as a goal variable when attempting to attain the limit, $E(t)$.

The total officer inventory may also be constrained by a budgetary limit, $B(t)$:

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^K b_{ijk}(t)y_{ijk}(t) \leq B(t). \quad (5)$$

Here $b_{ijk}(t)$ refers to the projected budgetary obligations resulting from having an officer of community i , from source j , with YCS k in the inventory in time period t ; for example, officer pay and allowances.

There are a number of constraints that limit the way officer accessions can be brought in from the various sources and distributed to communities. These constraints are represented below. First, the total accessions in each time period may be limited by some maximum value, $P(t)$:

$$\sum_{i=1}^I \sum_{j=1}^J x_{ij}(t) \leq P(t). \quad (6)$$

Next, there may be a maximum capacity limit, $R_i(t)$, on the number of accessions that can be accepted by each community in each time period:

$$\sum_{j=1}^J x_{ij}(t) \leq R_i(t). \quad (7)$$

An example of such a limit would be training capacity in the aviation community.

Each commissioning source will usually have upper and lower acceptable operating limits, $P_j(t)$ and $Q_j(t)$, in each time period:

$$Q_j(t) \leq \sum_{i=1}^I x_{ij}(t) \leq P_j(t). \quad (8)$$

For example, the U.S. Naval Academy might only be allowed to produce between 700 and 1000 new officers each year.

Finally, there may be upper and lower bounds, $P_{ij}(t)$ and $Q_{ij}(t)$, on the acceptable distribution of newly commissioned officers from each source to each community:

$$Q_{ij}(t) \leq x_{ij}(t) \leq P_{ij}(t). \quad (9)$$

As an example, there are policy limits on the maximum number of OCS graduates who are allowed to enter the aviation community.

The accession plan produced by the model should not have radical fluctuations in the operating levels of the sources or the total accessions into any of the communities from period to period. For this reason, the model uses "smoothing" constraints to limit such period to period fluctuations,

$$\alpha \sum_{j=1}^J x_{ij}(t) \leq \sum_{j=1}^J x_{ij}(t+1) \leq \beta \sum_{j=1}^J x_{ij}(t), \quad (10)$$

of accessions into each community, i , and

$$\gamma \sum_{i=1}^I x_{ij}(t) \leq \sum_{i=1}^I x_{ij}(t+1) \leq \delta \sum_{i=1}^I x_{ij}(t), \quad (11)$$

of the outputs from each source, j . Here α , β , γ , and δ are user-selected constants, which are proportions of change between time periods ($0 \leq \alpha \leq 1$, $0 \leq \gamma \leq 1$, $\beta \geq 1$, $\delta \geq 1$).

The remaining condition imposed by the model is that the variables are nonnegative:

$$x_{ij}(t) \geq 0, g_{im}^+(t) \geq 0, g_{im}^-(t) \geq 0, g^-(t) \geq 0. \quad (12)$$

The objective function for the AIDS model is given by

$$\begin{aligned} \text{Minimize} \quad & \sum_{t=1}^T \sum_{i=1}^I \sum_{m=1}^M (x_{im}^+(t)g_{im}^+(t) + w_{im}^-(t)g_{im}^-(t)) \\ & + \sum_{t=1}^T w^-(t)g^-(t). \end{aligned} \quad (13)$$

That is, the model seeks an officer accession and distribution plan that minimizes the sum of the weighted deviations from officer inventory goals over time, subject to the above constraints (1-12).

The constants and coefficients introduced in the discussion of the constraints are summarized below:

$I_{ij}(k)$	\equiv Initial onboard inventory of officers in community i , from source j , with YCS k .
$S_{ij}^t(k)$	\equiv Survival rate for t time periods for officers in community i , from source j , with initial YCS k .
$G_{im}(t)$	\equiv Inventory goal for officers in community i , for experience level m , in time period t .
$E(t)$	\equiv Upper limit on total officer inventory in period t .
$B(t)$	\equiv Budget limit for officer pay and allowances, period t .
$b_{ijk}(t)$	\equiv Cost of pay and allowances for an officer in community i , from source j , with YCS k , in time period t .
$\ell_i(m)$	\equiv Lower limit for YCS in experience level m for community i .
$u_i(m)$	\equiv Upper limit for YCS in experience level m for community i .

$P(t)$	≡ Upper limit on the total number of officers that may be commissioned in time period t .
$P_j(t)$	≡ Maximum number of officers that can be commissioned from source j in time period t .
$Q_j(t)$	≡ Minimum number of officers that can be commissioned from source j in time period t .
$R_i(t)$	≡ Maximum number of newly commissioned officers that can be accommodated in community i , in time t .
$P_{ij}(t)$	≡ Maximum allowable number of officers commissioned from source j to be assigned to community i , for time period t .
$Q_{ij}(t)$	≡ Minimum allowable number of officers commissioned from source j to be assigned to community i , for time period t .
$w_{im}^+(t)$	≡ Weight (penalty) given to positive deviation from officer inventory goal for community i , experience level m , time period t .
$w_{im}^-(t)$	≡ Weight (penalty) given to negative deviation from officer inventory goal for community i , experience level m , time period t .
$w^-(t)$	≡ Weight (penalty) given to negative deviation from total officer inventory limit, time period t .
I	≡ Number of communities in model.
J	≡ Number of commissioning sources in model.
K	≡ Maximum length of service in model.
M	≡ Number of experience levels in model.

Computational Consideration

Current applications of the AIDS model require the solution of linear programming (LP) problems of approximately 500 constraints and 1500 variables. This size reflects an efficient formulation of the model that differs in some details from the previous description. The inventories given by expression (1) are calculated as constants outside of the actual LP model generated for the problem. These values are used as data for the LP model in expressions (3), (4), and (5). The other inventories do not appear explicitly, but are replaced by the substitution of expression (2) in (3), (4), and (5). The upper and lower bounds on each accession variable, stated by expression (9), do not appear explicitly, but are taken into account through the "bounds" feature of available LP codes. The upper and lower bounds of expression (8) are represented by equality constraints with bounded slack variables, but could have been easily represented using the "ranges" feature of LP codes.

Problems of the size discussed above are conveniently solved with standard LP software packages. Some applications of the model may involve substantially larger LP problems--for example, those including more communities than currently planned, extending the portion of an officer's career considered beyond the first 10 years, or including grade or regular/reserve distinctions. It is necessary to consider alternate solution approaches for these larger scale applications to retain convenient or, in some cases, even feasible computation.

Expressions (6), (7), (8), and (9) considered together show a capacitated network model structure and may also be considered as a capacitated distribution (or transportation) model (Charnes & Klingman, 1970). The model may then be thought of as a set of capacitated distribution problems, linked together by goal constraints and smoothing constraints. The goal constraints (3) and (4) and the smoothing constraints (10) and (11) may be replaced by a different objective function expression than (13). The new objective function would be a nonlinear convex (perhaps quadratic) function of the goal deviations and the differences between the accession totals in adjacent time periods. The new formulation would represent an alternate, but not identical, approach to the problem addressed by the model--reducing deviations from inventory goals and maintaining low variation in accessions over time. The nonlinear capacitated network formulation of the model discussed above could be solved by a number of possible solution approaches. The network formulation may substantially reduce computation effort by allowing use of very efficient large-scale network codes (Glover, Karney, & Klingman, 1973).

Another possible computational improvement without recourse to a nonlinear objective function is the use of efficient codes being developed to solve LP problems with substantial network structure. Further investigation of these alternate solution techniques will be needed if the existing applications of the model are significantly expanded.

APPLICATION

The example described below illustrates a typical use of the AIDS model. In this example, the population considered is limited to officers of the Unrestricted Line (URL) warfare communities listed in Table 1. These communities comprise over 60 percent of the Navy's officers and are often grouped together for planning purposes. The commissioning sources used account for nearly all URL officers and are given in Table 2.¹ Only the first 10 years of commissioned service are included in this example, since this period covers most of the choke points that develop in URL warfare community planning. It should also be noted that the budgetary constraints (5) and total inventory constraints (4) were not used in this example. Budgetary and total inventory consequences can, of course, be calculated from results of the model.

Table 1
Designators and Warfare Communities

Designator	Description	Warfare Community
111X	Surface warfare officer	Surface
116X	Officer in training for surface warfare qualification	
112X	Submarine warfare officer	Submarine
117X	Officer in training for submarine warfare qualification	
131X	Aviation officer (pilot)	Pilot
139X	Officer in flight training	
132X	Naval flight officer (non-pilot)	Naval Flight Officer
137X	Officer in training for flight officer qualification	

¹See Goudreau, 1976 for a description of URL commissioning sources.

Table 2
Officer Commissioning Programs

Title	Description
USNA	U.S. Naval Academy
NROTC (S)	Naval Reserve Officer Training Corps regular (scholarship) program
NROTC (C)	Naval Reserve Officer Training Corps contract (non-scholarship) program
OCS	Officer Candidate School
NESEP	Naval Enlisted Scientific Education Program ^a
AOC	Aviation Officer Candidate Program (pilots)
NFOC	Naval Flight Officer Candidate program (non-pilots)
AVROC	Aviation Reserve Officer Candidate program

^aBeing phased out. See discussion on page 11.

The model must age accessions for 10 years to assess their impact on requirements filled by officers with 10 YCS. Thus, the example uses a 10-year planning horizon to account for this aging process. It is also necessary to consider effects of proposed accessions beyond the nominal planning horizon to avoid undesirable outcomes.²

Several approaches to this problem were tried using horizon "posture" constraints; for example, specifying an inventory for an additional time period that is consistent with the best steady state solution to inventory requirements.³ The example described here adopts the simple expedient of artificially extending the model horizon period to 20 years, so that accessions for the first 10 years are fully accounted for through the 10th YCS. Accessions developed for this second 10-year period are then discarded. Subsequent changes to the model software implement a more efficient treatment of the "legacy" of planned accessions. In this case, no accessions are generated past the nominal planning horizon, but goals are generated for previous accessions that remain in the system. These goals are duplicates of goals from the last planning period.

²Accessions in the last several time periods are only driven by early EXP requirements. The effects of these accessions upon later EXP requirements beyond the model horizon are not taken into account. Thus, inventories in these later EXP categories may differ substantially from inventory requirements that would have been specified if the planning horizon had been extended further. These end or finite horizon effects are common in planning models.

³Such an inventory was determined through use of a variation of the current model.

The example uses typical data supplied by Navy planners, modified to fit the size of the problem. The actual input data and output reports are too extensive for inclusion here, but Figures 1 and 2 and Table 3 summarize a sample of these data and model results. Figure 1 displays requirements and projected inventories for the submarine community in the 10th planning year. The horizontal axis represents the number of officers and the vertical axis represents YCS.⁴ The unshaded portion of each bar, terminated by a solid line, indicates the officer inventory projected for a particular YCS, using accessions developed by the model. The numbers within the bars give these projected inventories. The overlapping shaded portion of each bar, terminated by a dotted line, indicates the stated inventory requirement (goal) for each YCS. The signed number outside of the bars give the differences (goal deviations) between the projected inventories and the stated inventory requirements for each YCS cell. Operational submarine community requirements have not been specified for the first two YCS cells since this period represents training for subsequent service. Inventories for these cells are determined implicitly by requirements for later YCS cells.

The requirements decline in the 4th through 6th YCS cells, increase in the 7th and 8th cells, and decrease again in the 9th and 10th cells. This pattern reflects only those operational billets that require submarine warfare qualification. It is clear that this type of requirement structure cannot be met without lateral entry into the community, a flow that is not allowed. In the present example, there are large excesses of officers in the projected inventories for the 3rd through the 7th YCS cells. This example reflects the feasibility of meeting choke point requirements in the submarine community at the 8 to 10 YCS experience level. Thus, large penalties were placed on not meeting requirements for these cells. The large excesses at early YCS cells result from the model bringing in the number of officers that, when aged, will come as close as possible to meeting the choke point requirements. The excess officers in early YCS cells (beyond the training phase) can be rotated through staff and other assignments (such as 1000/1050 billets) to meet overall Navy requirements. This pattern of requirements and projected inventories is common to the other warfare communities as well, and reflects a strict classification of warfare community specific billets.

Even with the major emphasis on 8 to 10 YCS requirements, projected inventories fell short of meeting these requirements. Table 3 gives the accessions into the submarine community generated by the model for the 10th time period, as well as upper and lower bounds on these accessions. Each commissioning source is operating at its upper bound to produce the total of 820 accessions indicated in Table 3 and in the first YCS cell of Figure 1. Thus, at least one commissioning source must be allowed to produce more submarine officers if choke point requirements are to be met.

The results described do not include a commissioning source that has recently been phased out--the Navy Enlisted Scientific Education Program (NESEP). NESEP has traditionally supplied submarine officers with noticeably better retention through the first 10 YCS. These officers, however, tend to leave rapidly after about 10 YCS because they become eligible for retirement when their combined enlisted and commissioned service reaches 20 years. The example was modified to examine an alternative in which NESEP is allowed to continue at recent levels (a maximum of 100 per year, considerably below peak levels). Figure 2 presents the results for this case. Accessions, represented

⁴Since YCS refers to the year of commissioned service being served (a "year serving" definition), it varies between 1 and 11 to cover the first 10 years of service.

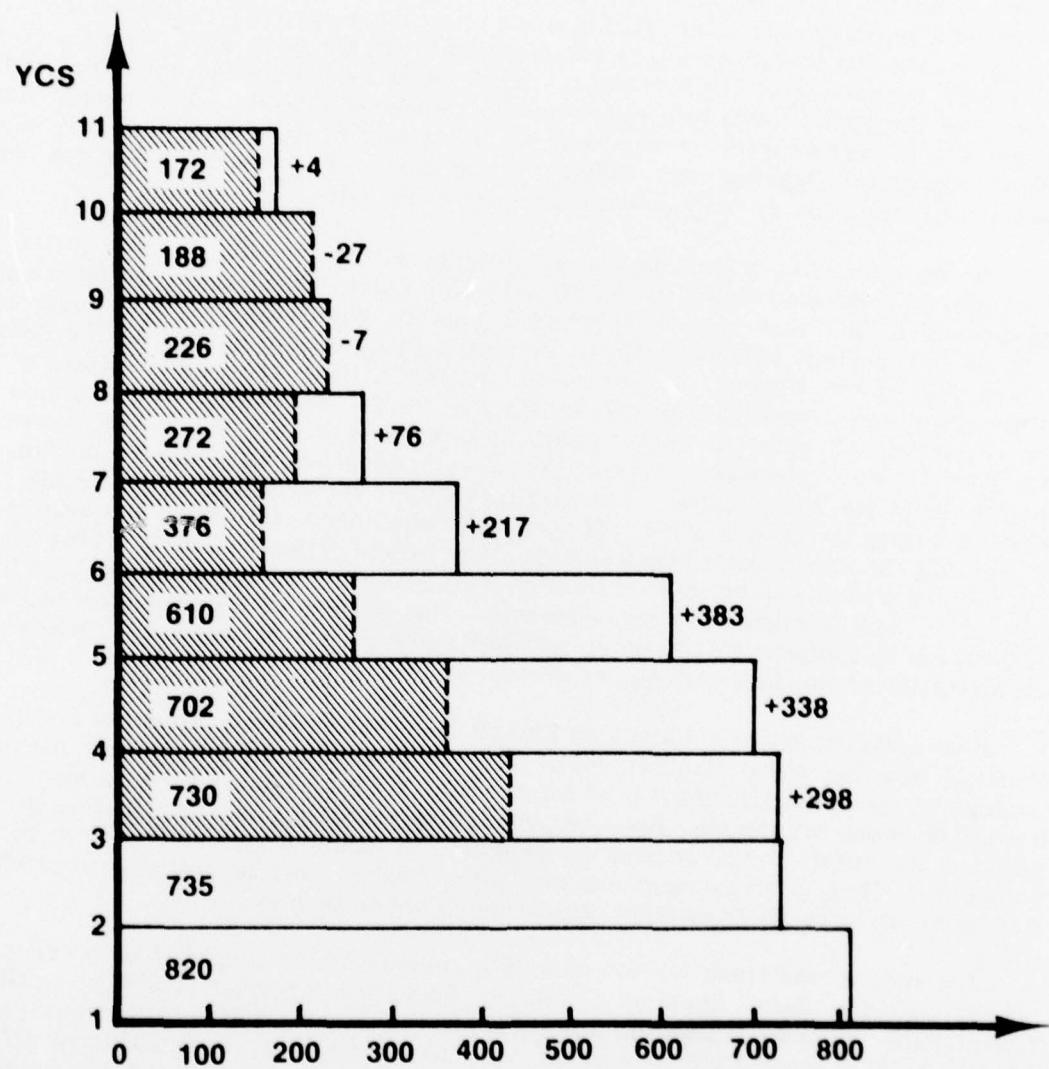


Figure 1. Submarine community inventory and requirements (NESEP omitted)

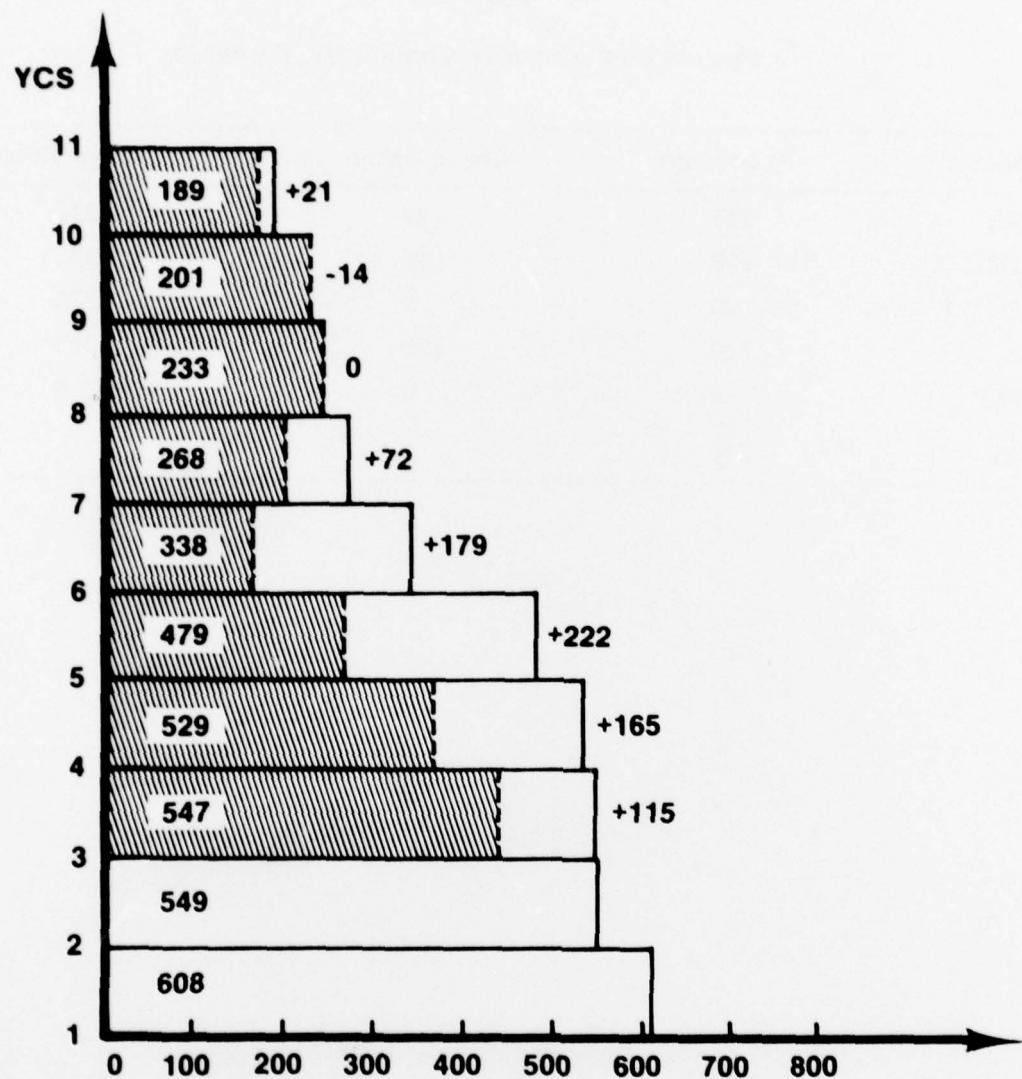


Figure 2. Submarine community inventory and requirements (NESEP retained),

by the first YCS cell inventory, have been reduced to 620--as compared to 820 in the previous case. Excess inventories in the early YCS cells are significantly reduced. Finally, 8 to 10 YCS requirements are much more closely met. Thus, it appears that submarine community requirements (at least through 10 YCS) would be better met if a commissioning program similar to NESEP were available.

Table 3
Accessions Into Submarine Community, Period 10

Source	Accessions	Lower Bound	Upper Bound
USNA	250	150	250
NROTC (S)	250	100	250
NROTC (C)	20	0	20
OCS	300	100	300
NESEP	0	0	0
Total	820		

CONCLUSIONS AND RECOMMENDATIONS

The examples discussed above illustrate several uses of the AIDS model. The basic purposes of the model are to determine the operating levels of various commissioning sources and the distribution of officers produced by each source to the different warfare communities, based upon community requirements. This kind of application produces an accession plan that may be used in the actual planning process. Another product of this application is the projection of community inventories and comparison with community requirements. Thus, the impact of the plan on the officer force can easily be seen. These outputs of the model can also be used to evaluate accession policies represented by source operating and distribution limits. For example, it was shown that submarine choke point requirements could not be met without relaxing the distribution limits of Table 3 for the case represented by Figure 1. The consequences of eliminating a commissioning source were also seen in the comparison of Figures 1 and 2.

The AIDS model can also be used to suggest or evaluate changes in the community requirements structures. Often the arrangement of tours in the career path is influenced by community career planning considerations, as experience requirements for operational billets may be more flexible than a specific requirements plan indicates. Outputs of the AIDS model indicate when large discrepancies between inventories and a particular set of requirements are likely to develop. The model may then be used to guide this choice of a different requirements structure.

The question of how to allocate excess officers in each community to overall Navy requirements for nonwarfare specific billets (such as 1000/1050 billets) has been addressed in different ways during development of the AIDS model. Resolution of this issue is still under consideration. [Finally, the AIDS model can be used by OP-130 accession planners to evaluate tradeoffs among requirements in the various officer communities.] In the example of Figures 1 and 2, high priority was placed upon meeting submarine community choke point requirements, which were filled at the expense of meeting requirements in other communities. Stated accession requirements by the various community accession planners often exceed total resources. The AIDS model provides a new opportunity to evaluate accession tradeoffs between communities in a systematic way.

While OP-130 has adopted the AIDS model for accession planning and policy analysis as a supplement to current planning procedures, further development is necessary if the model is to be significantly expanded. This may involve non-linear network formulations.

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